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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/038,066	01/03/2002	Liang-Yuh Chen	AMAT/5699/CMP/CMP/RKK	5741
32588	7590	12/04/2003		
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			EXAMINER WILKINS III, HARRY D	
			ART UNIT	PAPER NUMBER
			1742	

DATE MAILED: 12/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/038,066

Applicant(s)

CHEN ET AL.

Examiner

Harry D Wilkins, III

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-55 is/are pending in the application.
- 4a) Of the above claim(s) 25-39 and 52-55 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 and 40-51 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 1,4,5,6,8.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Election/Restrictions***

1. Applicant's election with traverse of group I in Paper No. 9 is acknowledged. The traversal is on the ground(s) that, as amended, the process as claimed cannot be practiced by an apparatus different from the presently claimed apparatus. This is not found persuasive because the method and apparatus are distinct inventions, as evidenced by the establishment of two distinct classifications in the art. In addition, the method, as claimed, can still be operated by a materially different apparatus, particularly one that uses manual means for controlling the positioning of the substrate and applying the polishing article to the substrate surface.

The requirement is still deemed proper and is therefore made FINAL.

2. Newly submitted apparatus claims 52-55 are directed to an invention that is independent or distinct from the elected invention for substantially the same reasons as indicated above. Accordingly, claims 52-55 are withdrawn from consideration as being directed to a non-elected invention.

***Examiner's Notes***

3. Throughout this action, several abbreviations will be used. Chemical Mechanical Polishing will be designated by CMP. ElectroChemical Polishing/Machining will be designated by ECP. ElectroChemical Mechanical Polishing will be designated by ECMP.

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***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-24 and 40-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu et al (US 6,099,604) in view of Mayer et al (US 6,315,883) and Uzoh et al (US 5,807,165).

Sandhu et al teach a CMP method of processing a substrate including (see paragraph spanning cols. 8 and 9 and figure 3) forming a passivation layer (60) on the substrate surface, introducing the substrate into an electrolyte (142), polishing the substrate in the electrolyte solution and removing material from at least a portion of the substrate surface.

Sandhu et al do not teach applying an anodic bias to the substrate surface.

Mayer et al teach (see col. 2, line 65 through col. 4, line 31 and col. 5, lines 31-46) an ECP method including immersing a substrate in an electrolyte, forming a

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passivation layer on the surface through means of a diffusion barrier film and applying an anodic bias to the substrate. This method achieves planarization of Damascene processed substrates.

Uzoh et al teach (see col. 2, lines 35-46) that by combining an existing CMP method with an existing ECP method, a new method is developed, ECMP, which is able to process substrates more quickly while reducing unnecessary damage to the substrate.

Therefore, it would have been obvious to one of ordinary skill in the art to have combined the CMP teachings of Sandhu et al with the ECP teachings of Mayer et al to create a faster method of ECMP as taught by Uzoh et al while reducing unnecessary damage to the substrate and because the ECP process of Mayer et al performs planarization on Damascene processed substrates.

Regarding claims 2-4, Mayer et al teach (see paragraph spanning cols. 11 and 12) that in addition to the normal composition, a brightening agent (*syn.* with corrosion inhibitor), such as benzotriazole, and a material that promotes more uniform plating (*syn.* with leveling agent), such as polyethylene glycol, are added to the electrolyte. The motivation to add these comes from the properties added. The brightening agent keeps an oxide film from forming, which would otherwise prevent electrochemical polishing, and the leveling agent promotes more uniform plating.

Regarding claims 5-7, Mayer et al teach (see col. 3, lines 35-46) that the passivation layer is a viscous liquid film based on phosphoric acid. Therefore, it would have been obvious to one of ordinary skill in the art to have used the viscous

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phosphoric acid film of Mayer et al in place of the passivation film of Sandhu et al because the film of Mayer et al (see abstract and col. 1, lines 18-21) allows masking of only desired sections, such as trenches in Damascene processing (title), thereby permitting desired even planarization.

Regarding claims 8 and 9, Sandhu et al teach (see paragraph spanning cols. 8 and 9) that the passivation layer is made from  $\text{SiO}_2$ , which is a dielectric layer.

Regarding claim 10, Mayer et al teach (see col. 10, lines 55-61) that the preferred electrolyte is based on concentrated phosphoric or sulfuric acid. Therefore, it would have been obvious to one of ordinary skill in the art to have used the viscous phosphoric acid film of Mayer et al in place of the passivation film of Sandhu et al because the film of Mayer et al (see abstract and col. 1, lines 18-21) allows masking of only desired sections, such as trenches in Damascene processing (title), thereby permitting desired even planarization.

Regarding claim 11, the electrolyte of Sandhu et al includes (see abstract) abrasive particles.

Regarding claim 12, while Mayer et al is silent as to the total voltage applied, it would have been within the expected skill of a routineer in the art to have selected and optimized an appropriate voltage for carrying out the method.

Regarding claim 13, Sandhu et al teach (see col. 8, lines 12-16) that the polishing article exerts of pressure of 2-10 psi, preferably towards the lower end of the range. Thus, Sandhu et al teach an overlapping range of pressure.

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Regarding claim 14, while Mayer et al is silent as to the total concentration of corrosion inhibitor and leveling agent added, it would have been within the expected skill of a routineer in the art to have selected and optimized an appropriate amount of each for carrying out the method and achieving the properties provided by each of these.

Regarding claim 15, taking Sandhu et al, Mayer et al and Uzoh et al into view, one of ordinary skill in the art would have applied a method of positioning the substrate adjacent the polishing article of Sandhu et al disposed in the electrolyte, exposed the substrate to a corrosion inhibitor, a leveling agent and a viscous forming agent as taught by Mayer et al to form a current suppressing layer, polishing the substrate as taught by Sandhu et al, which would be expected to remove a portion of the current suppressing layer, applying a voltage between the substrate and the cathode as taught by Mayer et al to remove material from at least a portion of the substrate surface with anodic dissolution.

Regarding claim 16, Uzoh et al teach (see col. 2, lines 54-58) that when the CMP and ECP are combined in ECMP the potential is varied by time. Therefore, it would have been obvious to one of ordinary skill in the art to have varied the potential by time as taught by Uzoh et al.

Regarding claim 17, see above regarding claim 12.

Regarding claim 18, see above regarding claim 10.

Regarding claim 19, see above regarding claim 3.

Regarding claim 20, see above regarding claim 4.

Regarding claims 21 and 22, see above regarding claims 5-7.

Regarding claim 23, see above regarding claim 14.

Regarding claim 24, see above regarding claim 11.

Regarding claim 40, Sandhu et al teach (see paragraph spanning cols. 5 and 6) that preferred chelating agents include citric acid and polyamines, such as ethylenediamine. Otherwise, see descriptions above.

Regarding claims 41-42, see above regarding claims 5-7.

Regarding claim 43, see above regarding claim 4.

Regarding claim 44, see above regarding claim 14.

Regarding claim 45, see above regarding claim 11.

Regarding claim 46, see descriptions above.

Regarding claim 47, see above regarding claim 10.

Regarding claim 48, see above regarding claim 3.

Regarding claim 49, see above regarding claim 40.

Regarding claim 50, see above regarding claim 4.

Regarding claim 51, see above regarding claim 11.

Regarding the ordering of steps, in the present claim no specific ordering is claimed. Thus, the method of Sandhu et al in combination with Mayer et al and Uzoh et al teach the method as claimed. In fact, it appears that Applicant intends to cover both orders of the first two steps, as claim 2 as well as claims 8 and 9 claim different orders. Claim 2 forms the passivation film after introducing the substrate into the electrolyte. Claims 8 and 9 form the passivation layer on the substrate before immersion. Sandhu



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et al teach forming the passivation layer before immersion. Mayer et al teach that the passivation layer can be formed either before or after immersion.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 10:00am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III  
Examiner  
Art Unit 1742

hdw

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